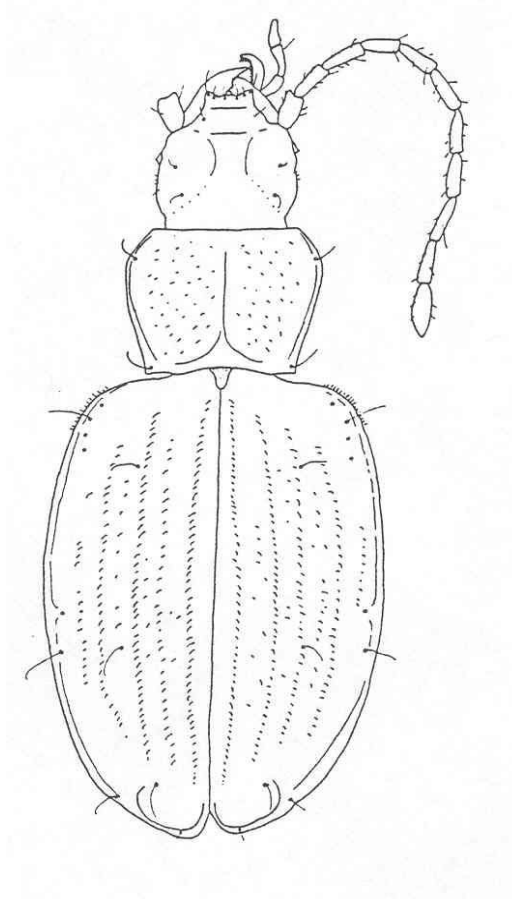


***Conservation Assessment
for
Marthas Cave Beetle (Pseudanophthalmus Hypertrichosis)***



(From Barr, 1960)

USDA Forest Service, Eastern Region
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This Conservation Assessment was prepared to compile the published and unpublished information on Pseudanophthalmus hypertrichosis. It does not represent a management decision by the U.S. Forest Service. Though the best scientific information available was used and subject experts were consulted in preparation of this document, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if you have information that will assist in conserving the subject community and associated taxa, please contact the Eastern Region of the Forest Service Threatened and Endangered Species Program at 310 Wisconsin Avenue, Milwaukee, Wisconsin 53203

Table of Contents

EXECUTIVE SUMMARY	4
NOMENCLATURE AND TAXONOMY	4
DESCRIPTION OF SPECIES	4
LIFE HISTORY.....	4
HABITAT	4
DISTRIBUTION AND ABUNDANCE	5
RANGEWIDE STATUS	5
POPULATION BIOLOGY AND VIABILITY	5
POTENTIAL THREATS.....	5
SUMMARY OF LAND OWNERSHIP AND EXISTING HABITAT PROTECTION.....	7
SUMMARY OF MANAGEMENT AND CONSERVATION ACTIVITIES.	7
RESEARCH AND MONITORING.....	7
RECOMMENDATIONS.....	7
REFERENCES.....	7

EXECUTIVE SUMMARY

The Marthas Cave beetle is designated as a Regional Forester Sensitive Species on the Monongahela National Forest in the Eastern Region of the Forest Service. The purpose of this document is to provide the background information necessary to prepare a Conservation Strategy, which will include management actions to conserve the species.

Pseudanophthalmus hypertrichosis is a rare cavernicolous ground beetle that has been found in 20 caves in Pocahontas, Greenbrier, Monroe and Randolph counties in eastern West Virginia. New information indicates that this species is actually limited in distribution to part of Pocahontas County.

NOMENCLATURE AND TAXONOMY

Classification:	Class Insecta Order Coleoptera Family Carabidae
Scientific name:	<u>Pseudanophthalmus hypertrichosis</u>
Common name:	Marthas Cave beetle
Synonyms:	<u>Pseudanophthalmus hypertrichosis</u> sensu latu

DESCRIPTION OF SPECIES

This species is an eyeless, unpigmented (red) cave beetle that attains the relatively large size of 5-6 millimeters in length. Identification of Pseudanophthalmus hypertrichosis requires dissection and microscopic examination of the genitalia by a specialist familiar in the taxonomy of the genus Pseudanophthalmus.

LIFE HISTORY

Nothing is known of the life history of Pseudanophthalmus hypertrichosis. However, Barr (personal communication, 2001) reported that in most of the troglobitic carabid beetles of eastern North America egg laying is timed for the fall, because food is generally more prevalent then. Larvae appear in the winter, pupae in the late winter and early spring, then tenerals start appearing in June and July. The beetles are almost all fully sclerotized by fall. Although this is a typical life history, the availability of food can change the cycle. The primary food source of Pseudanophthalmus is enchytraeid and tubificid worms found associated with cave mudbanks.

HABITAT

Pseudanophthalmus hypertrichosis is an obligate subterranean beetle that was reported as occurring on damp mud banks in caves by Holsinger, et al. (1976).

DISTRIBUTION AND ABUNDANCE

Pseudanophthalmus hypertrichosis sensu latu was reported from 20 caves in Pocahontas, Greenbrier, Monroe and Randolph counties West Virginia (Holsinger, Culver & Baroody, 1976). Barr (personal communication, 2001, in review of this assessment) reported that the species concept of Holsinger, et al. (1976) was correct only in the broad sense, as the populations in Greenbrier and Monroe counties are actually P. henroti. The Randolph County populations are also not conspecific with Pseudanophthalmus hypertrichosis. Thus, this species is restricted to caves in Pocahontas County.

RANGEWIDE STATUS

Global Rank: G1/G2 critically imperiled/imperiled ; The global rank of G1 is assigned to species known from 1-5 sites; G2 is assigned to species that are known from 6-20 localities. Pseudanophthalmus hypertrichosis was reported from 13 caves in Pocahontas County by Holsinger, et al. (1976), but it remains unknown how many of these are actually correctly assigned to this species.

West Virginia State Rank: S1/S2 critically imperiled/imperiled; The state rank of S1 is similarly assigned to a species known from 1-5 localities and S2 is assigned to species that are reported from 6-20 localities within the state. Pseudanophthalmus hypertrichosis is endemic to in West Virginia.

POPULATION BIOLOGY AND VIABILITY

Holsinger, et al. (1976) reported that Pseudanophthalmus hypertrichosis was a polytypic species with at least three subspecies present: (1) populations in Greenbrier and northern Monroe counties originally described as P. henroti by Jeannel (1949); (2) populations in Pocahontas County south of Marlinton; and (3) populations in northern Pocahontas and southern Randolph counties. As noted above, only selected Pocahontas County populations are now considered to be Pseudanophthalmus hypertrichosis.

POTENTIAL THREATS

Due to the presence of Pseudanophthalmus hypertrichosis in the restricted cave environment, it is susceptible to a wide variety of disturbances (Elliott, 1998). Caves are underground drainage conduits for surface runoff, bringing in significant quantities of nutrients for cave communities. Unfortunately, contaminants may be introduced with equal ease, with devastating effects on cave animals. Potential contaminants include (1) sewage or fecal contamination, including sewage plant effluent, septic field waste, campground outhouses, feedlots, grazing pastures or any other source of human or animal waste (Harvey and Skeleton, 1968; Quinlan and Rowe, 1977, 1978; Lewis, 1993; Panno, et al 1996, 1997, 1998); (2) pesticides or herbicides used for crops, livestock, trails, roads or other applications; fertilizers used for crops or lawns (Keith and Poulson, 1981; Panno, et al. 1998); (3) hazardous material introductions via accidental spills or deliberate dumping, including road salting (Quinlan and Rowe, 1977, 1978; Lewis, 1993, 1996).

Habitat alteration due to sedimentation is a pervasive threat potentially caused by logging, road or other construction, trail building, farming, or any other kind of development that disturbs groundcover. Sedimentation potentially changes cave habitat, blocks recharge sites, or alters flow volume and velocity. Keith (1988) reported that pesticides and other harmful compounds like PCB's can adhere to clay and silt particles and be transported via sedimentation.

Impoundments may detrimentally affect cave species. Flooding makes terrestrial habitats unusable and creates changes in stream flow that in turn causes siltation and drastic modification of gravel riffle and pool habitats. Stream back-flooding is also another potential source of introduction of contaminants to cave ecosystems (Duchon and Lisowski, 1980; Keith, 1988).

Smoke is another potential source of airborne particulate contamination and hazardous material introduction to the cave environment. Many caves have active air currents that serve to inhale surface air from one entrance and exhale it from another. Potential smoke sources include campfires built in cave entrances, prescribed burns or trash disposal. Concerning the latter, not only may hazardous chemicals be carried into the cave environment, but the residue serves as another source of groundwater contamination.

Numerous caves have been affected by quarry activities prior to acquisition. Roadcut construction for highways passing through national forest land is a similar blasting activity and has the potential to destroy or seriously modify cave ecosystems. Indirect effects of blasting include potential destabilization of passages, collapse and destruction of stream passages, changes in water table levels and sediment transport (Keith, 1988).

Oil, gas or water exploration and development may encounter cave passages and introduce drilling mud and fluids into cave passages and streams. Brine produced by wells is extremely toxic, containing high concentrations of dissolved heavy metals, halides or hydrogen sulfide. These substances can enter cave ecosystems through breach of drilling pits, corrosion of inactive well casings, or during injection to increase production of adjacent wells (Quinlan and Rowe, 1978).

Cave ecosystems are unfortunately not immune to the introduction of exotic species. Out-competition of native cavernicoles by exotic facultative cavernicoles is becoming more common, with species such as the exotic millipede Oxidus gracilis affecting both terrestrial and aquatic habitats.

With the presence of humans in caves comes an increased risk of vandalism or littering of the habitat, disruption of habitat and trampling of fauna, introduction of microbial flora non-native to the cave or introduction of hazardous materials (e.g., spent carbide, batteries). The construction of roads or trails near cave entrances encourages entry.

SUMMARY OF LAND OWNERSHIP AND EXISTING HABITAT PROTECTION

The Piddling Pit Cave population of Pseudanophthalmus hypertrichosis lies on TNC property within the Monongahela National Forest. The type-locality at Martha's Cave as well as numerous other sites are on private property within the Monongahela National Forest, including Blue Springs, Bolling, Cass, Clyde Cochrane Sinks, Friels, Grimes, Linwood, Martens and Tub caves.

SUMMARY OF MANAGEMENT AND CONSERVATION ACTIVITIES

There are no species specific activities relating to Pseudanophthalmus hypertrichosis.

The existing (1985) Monongahela Land and Resource Management Plan does not provide management direction for caves although they are being considered in the Forest Plan revision currently underway. A Forest Plan Amendment in progress for Threatened and Endangered Species will include management for the caves on the forest.

RESEARCH AND MONITORING

Much of what is known about Pseudanophthalmus hypertrichosis was gathered during the project of Holsinger, et al. (1976), in which data from 190 caves in 14 counties was gathered.

RECOMMENDATIONS

Retain on list of Regional Forester Sensitive Species.

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